

Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

1. (Currently Amended) An exhaust system for a lean-burn internal combustion engine, ~~which system~~ comprising:

a nitrogen oxide (NO_x) absorbent;

a first catalyst for catalysing the selective catalytic reduction (SCR) of NO_x with a NO_x -specific reactant disposed upstream of the NO_x absorbent;

first means for introducing a NO_x -specific reactant, or a precursor thereof, into an exhaust gas upstream of the first SCR-catalyst; and

means for controlling the introduction of the NO_x -specific reactant, or the precursor thereof, into the exhaust gas via the first introducing means, ~~wherein the SCR catalyst is disposed upstream of the NO_x absorbent, and optionally with the NO_x absorbent,~~ wherein the ~~control means~~ for controlling is arranged:
 - (a) causes the introduction of a first amount of NO_x -specific reactant, or the precursor thereof, to contact the NO_x absorbent insufficient to completely reduce the total NO_x stored on the NO_x absorbent when the first catalyst is inactive for reducing NO_x to N_2 ; and
 - (b) causes the introduction of a second amount of NO_x -specific reactant, or the precursor thereof, to contact the first catalyst when the first catalyst is active for reducing NO_x to N_2 , wherein the second amount of NO_x -specific reactant is of a sufficient amount such that NO_x -specific reactant slips the first catalyst and contacts the NO_x absorbent to reduce the NO_x stored on the NO_x absorbent and regenerate the NO_x absorbent.
2. (Currently Amended) An exhaust system according to claim 1, wherein the first SCR catalyst ~~has an activity~~ is determined by its temperature.
3. (Currently Amended) An exhaust system according to claim 2, wherein the ~~control~~ means for controlling causes the introduction of ~~introduces the~~ second amount of NO_x -

specific reactant_i or the precursor thereof, when the first SCR-catalyst is above a first pre-determined temperature.

4. (Currently Amended) An exhaust system according to claim 1, ~~2 or 3~~, wherein the ~~control means~~ for controlling is arranged to interrupt the introduction of the first amount ~~supply of the~~ NO_x-specific reactant_i or the precursor thereof_i ~~to the exhaust gas~~ when the first SCR-catalyst is hot enough to oxidise NO_x-specific reactant to NO.
5. (Currently Amended) An exhaust system according to claim 1, wherein the means for controlling is arranged to interrupt the ~~supply~~ first amount of NO_x-specific reactant_i or the precursor thereof ~~is interrupted~~ when the first SCR-catalyst is above a second pre-determined temperature.
6. (Currently Amended) An exhaust system according to ~~any of claims claim 1, to 5~~, comprising a second means for introducing the NO_x-specific reactant_i or the precursor thereof, ~~which second introducing means is disposed upstream of~~ into the exhaust gas between the NO_x absorbent and downstream of the first SCR-catalyst.
7. (Currently Amended) An exhaust system according to claim 6, wherein the means for controlling ~~control means is arranged to~~ causes the second means to introduce ~~supply~~ the NO_x-specific reactant_i or the precursor thereof_i to the exhaust gas only when the NO_x absorbent is above a temperature at which ~~NO_x regeneration is effective~~ the NO_x absorbent is regenerated.
8. (Currently Amended) An exhaust system according to claim 7, wherein the temperature ~~at above which the NO_x regeneration is effective~~ absorbent is regenerated is a third pre-determined temperature.
9. (Currently Amended) An exhaust system according to claim 7 ~~or 8~~, wherein the means for controlling causes the second ~~control means is arranged to~~ interrupt the supply introduction of the NO_x-specific reactant_i or the precursor thereof_i to the exhaust gas when the NO_x absorbent is above a temperature at which NO_x storage on the NO_x absorbent is effectively thermally limited.

10. (Currently Amended) An exhaust system according to claim 9, wherein the temperature ~~at~~of the NO_x absorbent below which NO_x storage is effectively thermally limited is a fourth pre-determined temperature.
11. (Currently Amended) An exhaust system according to claim 3, wherein the first pre-determined temperature is in the range from 100-600°C, ~~preferably 150-500°C and most preferably 200-450°C.~~
12. (Currently Amended) An exhaust system according to claim 5, wherein the second pre-determined temperature is in the range from 450-900°C, ~~preferably 550-800°C and most preferably 650-700°C.~~
13. (Currently Amended) An exhaust system according to claim 8 ~~or 11~~, wherein the third pre-determined temperature is in the range from 75-2600°C, ~~preferably 100-175°C and most preferably 125-600°C.~~
14. (Currently Amended) An exhaust system according to any claim ~~13~~3, wherein the first pre-determined temperature is the same as ~~the~~a third pre-determined temperature at which the means for controlling causes the second means to introduce a supply the NO_x-specific reactant, or the precursor thereof, to the exhaust gas only when the NO_x absorbent is regenerated.
15. (Currently Amended) An exhaust system according to claim 10, wherein the fourth pre-determined temperature is in the range from 350-600°C, ~~preferably 400-550°C and most preferably 450-500°C.~~
16. (Currently Amended) An exhaust system according to ~~any preceding~~claim 1 further comprising a catalyst for oxidising NO in the exhaust gas to NO₂ and a filter for collecting particulate matter in the exhaust gas for combustion ~~in~~of the NO₂ at temperatures up to 400°C.
17. (Currently Amended) An exhaust system according to claim 16, wherein the filter is located upstream of the ~~SCR~~first catalyst.
18. (Currently Amended) An exhaust system according to claim 16, wherein the first SCR catalyst is disposed on the filter.

19. (Currently Amended) An exhaust system according to claim ~~16 or~~ 18, wherein the NO_x absorbent is disposed on the filter.
20. (Currently Amended) An exhaust system according to ~~any preceding claim, further~~ 1, comprising a second SCR-catalyst disposed downstream of the NO_x absorbent.
21. (Currently Amended) An exhaust system according to ~~any preceding claim~~ 1, further ~~comprising, including~~ at least one sensor for detecting a concentration of the NO_x-specific reactant_x or the precursor thereof_x in the exhaust gas ~~positioned~~ downstream of the first SCR catalyst.
22. (Currently Amended) An exhaust system according to ~~any preceding claim~~ 1, further ~~comprising, including~~ at least one sensor for detecting a concentration of the ~~NO_x-specific~~ NO_x-specific reactant_x or the precursor thereof_x in the exhaust gas ~~positioned~~ downstream of the NO_x absorbent.
23. (Currently Amended) An exhaust system according to claim ~~21, or~~ 22, wherein the ~~control means~~ for controlling regulates the ~~supply introduction~~ of the NO_x-specific reactant_x or the precursor thereof_x in response to ~~the~~ detected concentration of the NO_x-specific reactant_x or the precursor thereof_x in the exhaust gas, ~~thereby~~ to reduce slip of the NO_x-specific reactant_x or the precursor thereof to the NO_x absorbent.
24. (Currently Amended) An exhaust system according to ~~any preceding claim~~ 1, wherein the ~~control means~~ for controlling regulates the ~~supply introduction~~ of the NO_x-specific reactant_x or the precursor thereof_x in response to exhaust gas temperature.
25. (Currently Amended) An exhaust system according to ~~any preceding claim~~ 1, wherein the ~~control means~~ controlling regulates the ~~supply introduction~~ of the NO_x-specific reactant_x or the precursor thereof_x in response to a pre-determined setting in an engine speed/load map.
26. (Currently Amended) An exhaust system according to ~~any preceding claim~~ 1, wherein the ~~control means~~ for controlling ~~is arranged to supply the~~ causes the introduction of the NO_x-specific reactant_x or the precursor thereof_x intermittently and at "spike" concentration.

27. (Currently Amended) An exhaust system according to claim 26, wherein ~~each a period between the introduction supply of the NO_x-specific NO_x-specific reactant, or the precursor thereof, is selected from~~ the range from 1 second to 10 minutes.
28. (Currently Amended) A lean-burn internal combustion engine ~~including comprising an exhaust system according to any preceding claim 1.~~
29. (Currently Amended) An engine according to claim 28, wherein ~~the engine~~ is a diesel engine or a gasoline engine.
30. (Currently Amended) A process for treating NO_x in an exhaust gas ~~from of a lean-burn internal combustion engine, the process comprising the steps of: which engine including an exhaust system comprising~~
contacting a nitrogen oxide (NO_x) absorbent with the exhaust gas;
contacting and a first catalyst for catalysing the selective catalytic reduction (SCR) of NO_x with a NO_x-specific reactant, wherein the first SCR-catalyst is disposed upstream of the NO_x absorbent; and optionally with the NO_x-absorbent, which process comprising;
regenerating the NO_x absorbent when:
 - (i) the first catalyst is inactive for reducing NO_x to N₂, by contacting the NO_x absorbent with a first amount of NO_x-specific reactant insufficient to completely reduce the total NO_x stored on the NO_x absorbent; and
 - (ii) the first catalyst is active for reducing NO_x to N₂, by contacting the first catalyst with a second amount of NO_x-specific reactant sufficient to reduce NO_x in the exhaust gas to N₂, and to slip the first SCR catalyst to reduce NO_x stored on the NO_x absorbent.
31. (Currently Amended) A process according to claim 30, wherein the activity of the first SCR-catalyst activity ~~is determined by its temperature relative to a first predetermined temperature.~~

32. (Currently Amended) A process according to claim 30 ~~or 31~~, wherein the NO_x-specific reactant for contacting the NO_x absorbent when the first SCR-catalyst is inactive does not contact said first SCR-catalyst.
33. (Currently Amended) A process according to claim 30, ~~31 or 32~~, wherein, ~~when said SCR catalyst is active, sufficient NO_x-specific reactant contacts the SCR catalyst to reduce NO_x in the exhaust gas to N₂ and slips past the SCR catalyst to contact the NO_x absorbent thereby to reduce stored NO_x, step (b) comprises selecting the second amount which process is controlled so that the slipped NO_x-specific reactant that slips the first SCR catalyst is of an insufficient amount to completely to reduce the total NO_x stored on the NO_x absorbent.~~
34. (Currently Amended) ~~An exhaust system~~ A process according to claim 31, wherein the first pre-determined temperature is in the range from 100-600°C, ~~preferably 150-500°C and most preferably 200-450°C.~~
35. (Currently Amended) A process according to ~~any of claims claim 30 to 34~~, wherein the first amount of NO_x-specific reactant at the end of regeneration regenerates the NO_x absorbent to an amount wherein, the NO_x absorbent contains 5 to 50% of the content of total NO_x stored on the NO_x absorbent present at the start of regeneration.
36. (Currently Amended) A process according to ~~any of claims 30 to 35~~, wherein the second amount of NO_x-specific reactant contacts and slips the first catalyst to reduce NO_x stored on the NO_x absorbent regeneration is started when the NO_x absorbent contains 5 to 50% of the total NO_x stored on the NO_x absorbent content at which NO_x slip takes place.
37. (Currently Amended) A process according to ~~any of claims 30 to 36~~, wherein the regeneration step is controlled to stop at one of the following points:
- (a) when NO_x-specific reactant is detected at a point part-way along the length of a substrate carrying the NO_x absorbent;
 - (b) in a system having two substrates carrying the solid absorbent in series, when NO_x-specific reactant is detected at a point between the substrates;

- (c) _____ when a level of NO_x content prescribed on the basis of pre-determined data in an engine speed/load map has been reached;
- (d) _____ when a level of NO_x content established iteratively from an initial observation of NO_x-specific reactant slip has been reached.
38. (Currently Amended) A process according to ~~any of claims 30 to 37~~, wherein when the first catalyst is inactive for reducing NO_x to N₂, the time period step of absorption and/or regeneration is in the range of from regenerating the NO_x absorbent by contacting the NO_x absorbent with NO_x-specific reactant has a duration of about 1 second to 10 minutes.
39. (Currently Amended) A process according to ~~any of claims 30 to 38~~, wherein the NO_x absorbent is supported on a first substrate and the first SCR catalyst is supported on a second substrate.
40. (Currently Amended) A process according to ~~any of claims 30 to 39~~, wherein the ~~NO_x specific~~ NO_x-specific reactant is produced *in situ* from a precursor thereof.
41. (Currently Amended) A process according to claim 40, further ~~including~~ comprising a step of catalytically reacting the precursor to provide the NO_x-specific NO_x-specific reactant.
42. (Currently Amended) A process according to ~~any of claims 30 to 41~~, wherein the starting exhaust gas is the exhaust that of a lean burn, especially diesel, internal combustion engine.
43. (New) An exhaust system according to claim 1, wherein the SCR catalyst is ~~also~~ co-located with the NO_x absorbent.
44. (New) An exhaust system according to claim 11, wherein the first pre-determined temperature is in the range from 150-500°C.
45. (New) An exhaust system according to claim 11, wherein the first pre-determined temperature is in the range from 200-450°C.

46. (New) An exhaust system according to claim 12, wherein the second pre-determined temperature is in the range from 550-800°C.
47. (New) An exhaust system according to claim 12, wherein the second pre-determined temperature is in the range from 650-700°C.
48. (New) An exhaust system according to claim 13, wherein the third pre-determined temperature is in the range from 100-200°C.
49. (New) An exhaust system according to claim 13, wherein the third pre-determined temperature is in the range from 125-175°C.
50. (New) An exhaust system according to claim 15, wherein the fourth pre-determined temperature is in the range from 400-550°C.
51. (New) An exhaust system according to claim 15, wherein fourth pre-determined temperature is in the range from 450-500°C.
52. (New) An exhaust system according to claim 22, wherein the control means regulates the supply of the NO_x-specific reactant, or the precursor thereof, in response to a detected concentration of the NO_x-specific reactant, or the precursor thereof, in the exhaust gas, thereby to reduce slip of the NO_x-specific reactant, or the precursor thereof.
53. (New) A process according to claim 34, wherein the first pre-determined temperature is in the range from 150-500°C.
54. (New) A process according to claim 34, wherein the first pre-determined temperature is in the range from 200-450°C.
55. (New) A process according to claim 30, wherein the first catalyst is active for reducing NO_x to N₂, the step of regenerating the NO_x absorbent by contacting the NO_x absorbent with NO_x-specific reactant has a duration of about 1 second to 10 minutes.